Natural Capitalism Group

BOULDER, COLORADO

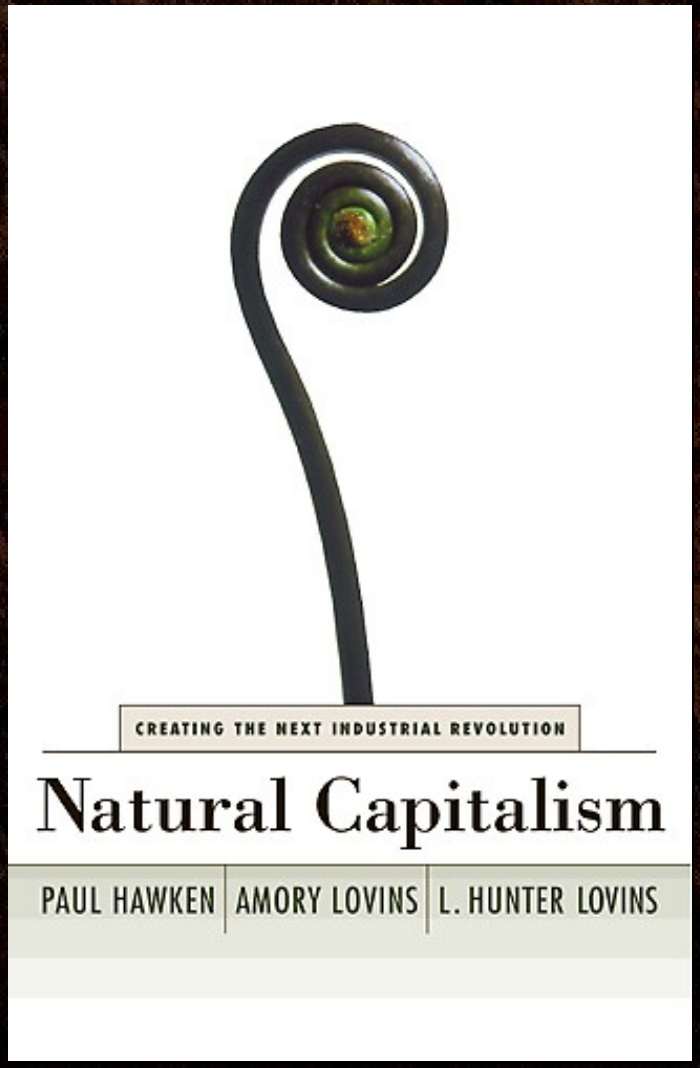
SUSTAINABLE OPPORTUNITIES for THE MILITARY

© Hunter Lovins, 2003

What is sustainability?

The challenges facing the earth

Natural Capitalism



Challenges Military Bases Face

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

History of Sustainability

Dana Meadows

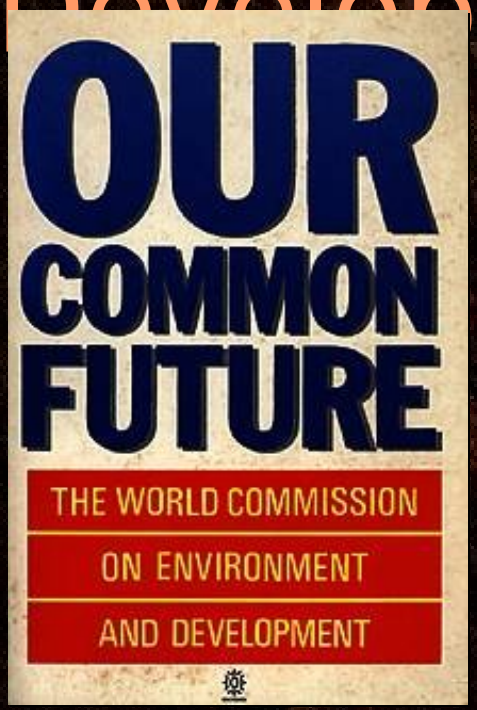
Author: *Limits to Growth*
1972 - first use of the term "Sustainability"

Author *Beyond the Limits*

Founder Balaton Network

Founder Sustainability Institut

The World Commission on Environment and Development



"[Sustainable development] meets the needs of the present without compromising the ability of future generations to meet their own needs."

Forum for the Future

"Sustainable development is a process which enables all people to realize their potential and improve their quality of life in ways which protect and enhance the Earth's life-support systems."

Jonathan Porritt

Author of *Seeing Green*, Advisor to Prince of Wales Business Leaders Forum

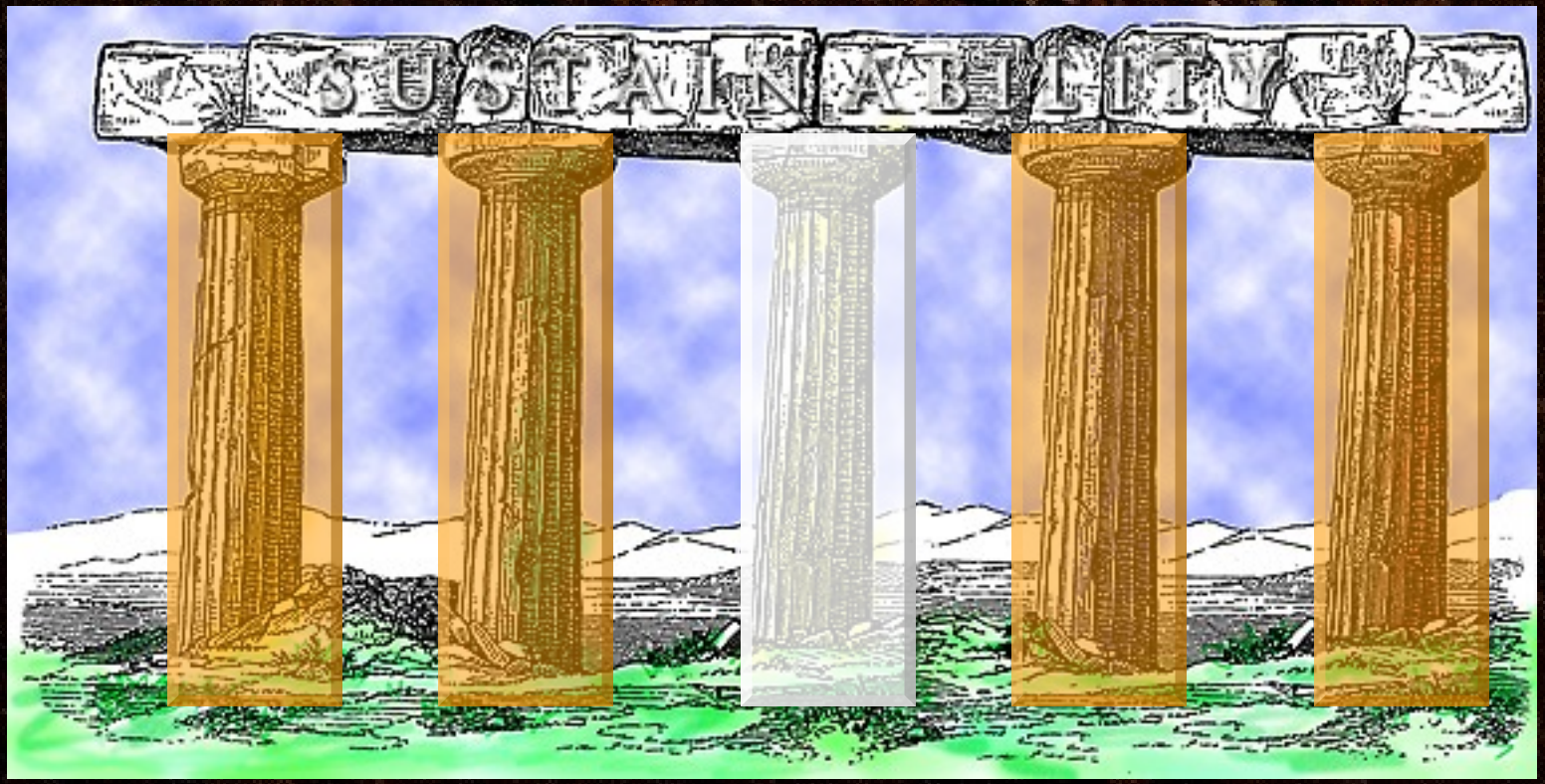
Walter Stahel

. . . the real value of sustainability is as a vision . . .

Walter Stahel

Natural Capitalism

The fulcrum on which to lever the other four . . .



Conservation

Health & Safety

Energy, materials efficiency

Social ecology

Cultural ecology

“Cradle to cradle” economy

Walter Stahel

- Greater durability
- Minimum-materials design & manufacturing
- Recovery of scrap
- Repair, reuse, & remanufacturing
- Recycling
- Downcycling

Illustration: Harvard Business Review (May/June 1999)

IFC Annual Report, p. 67

- IFC has made sustainability a corporate priority because of the fundamental changes affecting our clients, our countries and ourselves. Public understanding of environmental, social and corporate governance issues is growing, driven by press reports, activism and ever growing communications

Time for a new relationship with our earth

The Challenge

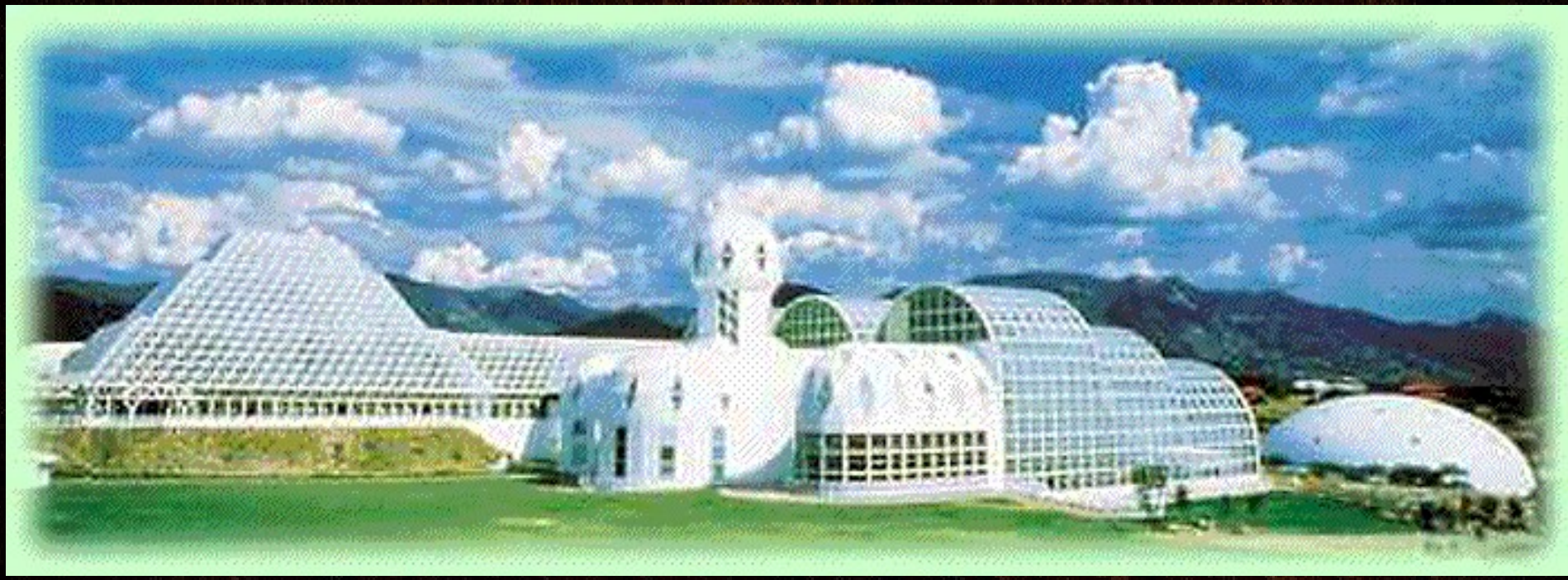
There is no longer any serious scientific doubt that every major ecosystem in the world is in decline

Ecosystem Services
what an intact ecosystem gives to our economy

- Climate regulation
- Incubation of new life (*e.g.* fish habitat)
- Nutrient cycling
- Water and air purification
- Waste management
- Erosion control
- Pest control

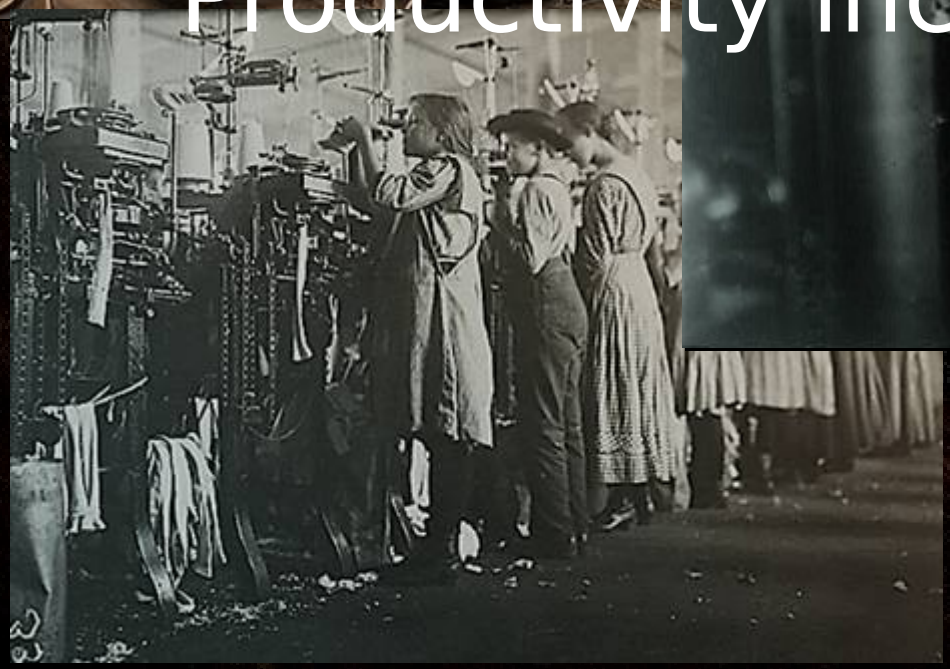
- Temperature moderation
- Noise reduction
- Economical landscaping
- Storm-water retention
- Tourist attractions

Biosphere II



$200,000,000

Industrial Revolution



Productivity increase: 100X

First Industrial Revolution:

People are scarce and nature is abundant — Increase labor productivity.

The old mental model

Tax the use of people, subsidize the use of resources protect the corporate charter: everyone will prosper

Next Industrial Revolution:

People are abundant and nature is scarce — increase resource productivity.

The new paradigm

Efficiency
Biomimicry
Restoration

Natural Capitalism is today's route to prosperity

Next Industrial Revolution

New business logic:
4X, 10X,

even 100X

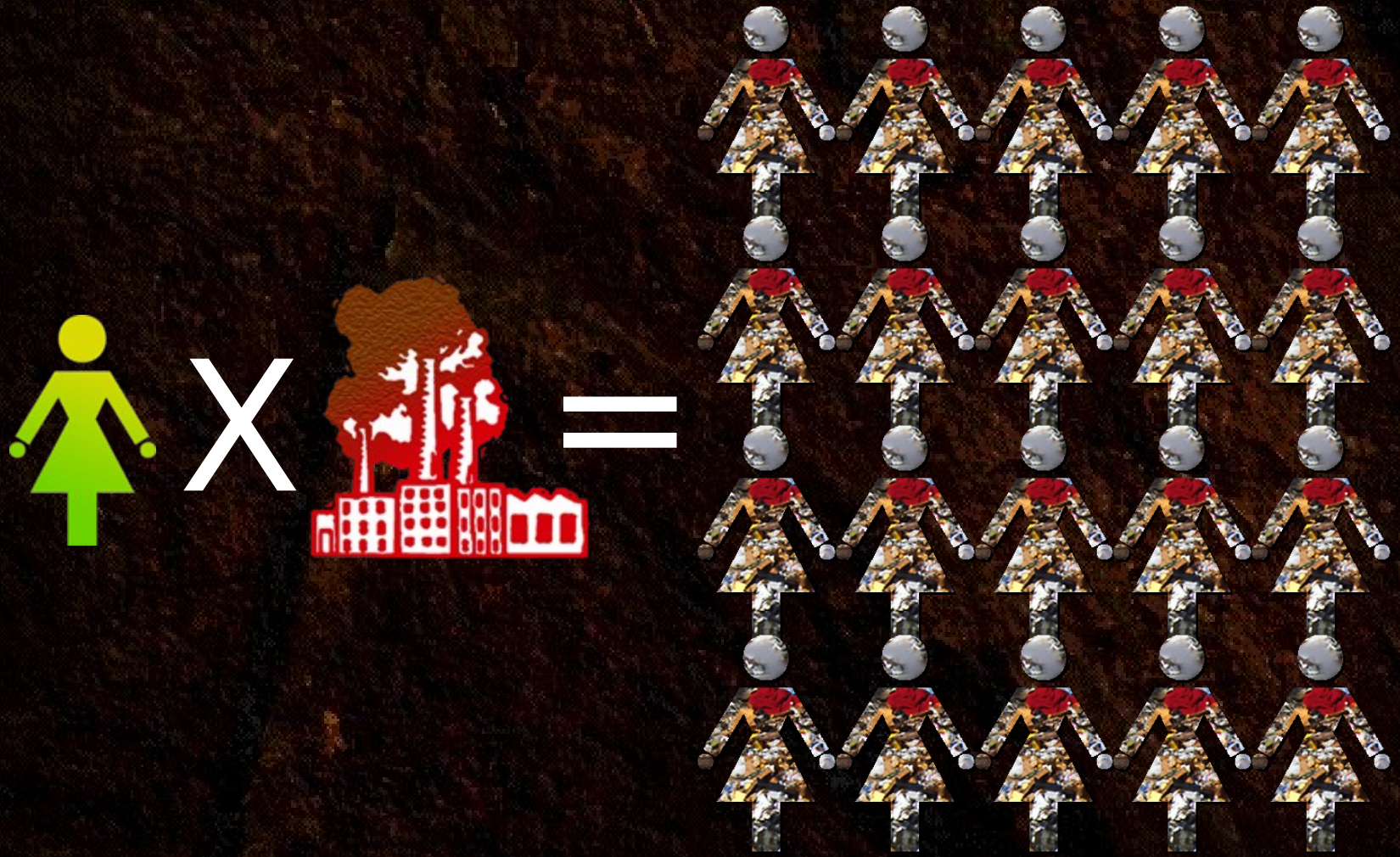
as much benefit—
from each unit of resources.

Principles of Natural Capitalism:

1. Radically increased resource productivity
2. Biomimicry: closed loops, no waste, no toxicity
3. Reinvest in natural capital

Ensure no net loss of human or natural capital

Incredible waste



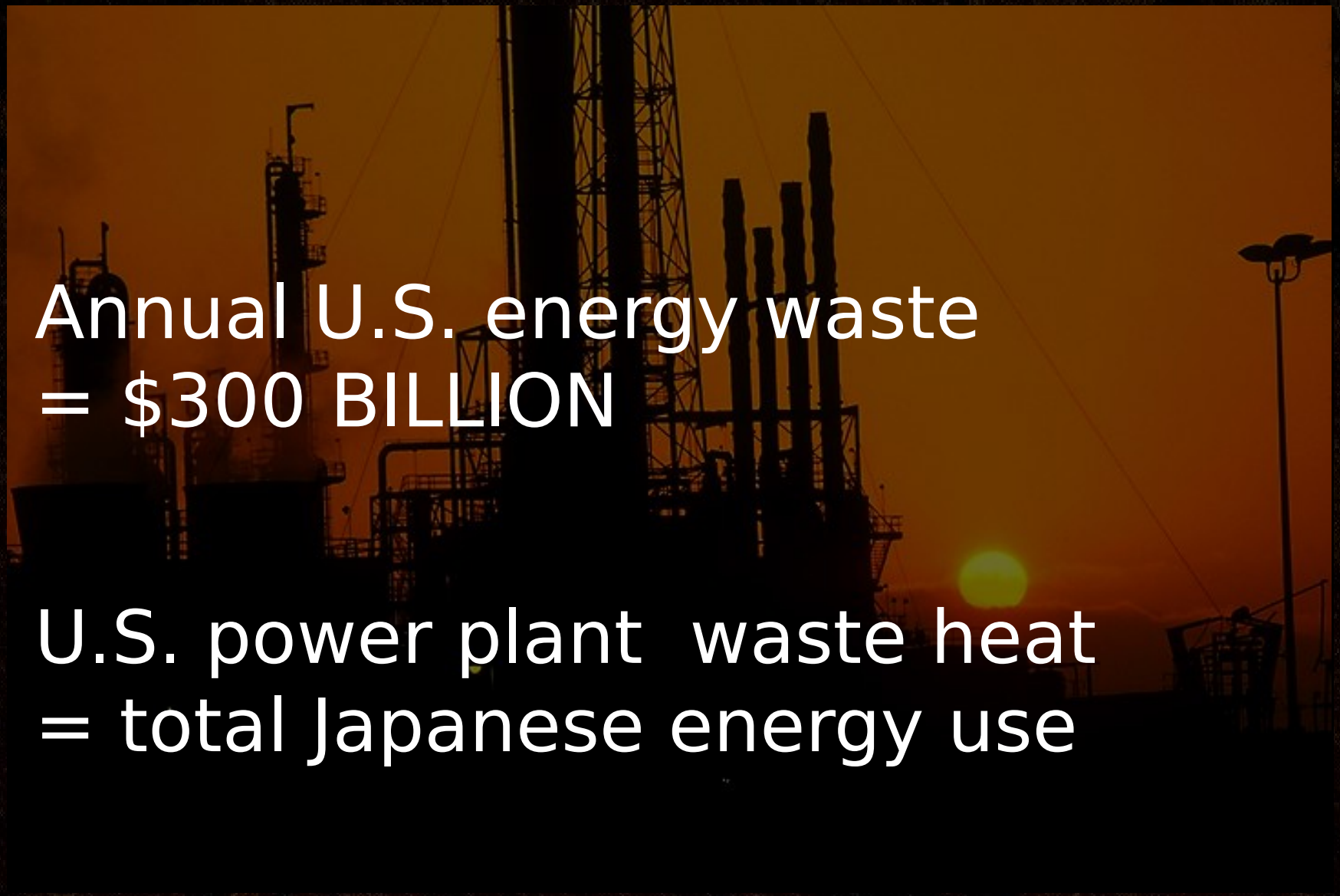
Materials flow per person per day = 20 X body weight

Materials mobilized in economy, put into products, & still there six months after sale = 1%

+

Global Waste =
500 BILLION tons per year

= VAST business opportunity



Annual U.S. energy waste
= $300 BILLION

U.S. power plant waste heat
= total Japanese energy use

Vulnerability of the Domestic Energy Sector

EPRI website satellite image, 10 August 1996… The U.S. at night.

~98–99% of U.S. outages are caused by grid failure.

Vulnerability of the Domestic Energy Sector

35 seconds later, an Oregon power line sagged into a tree.

Sloppy operations and poor communications blacked out four million people in Western states and parts of Canada

A 1981 quote: *Brittle Power*, a study on Domestic Energy Vulnerability commissioned by the Pentagon

"These brittle devices are supposed to form the backbone of America's energy supplies into the 21st century — a period likely to bri increasing uncertainty, surprise, unrest, and violence. The U.S. cannot afford vulnerabilit that so alter the balance between large and groups in society as to erode not only milita security but also the freedom and trust that underpin constitutional government."

Lovins & Lovins

Inherently vulnerable system architecture

- ***Complexity — sometimes beyond understanding***
  (big electric grids)
- ***Control and synchronism requirements***
- ***Reliance on vulnerable telecoms & IT***
- ***Hazardous fuels, often in or near cities***
  - ***Standard fuel-oil delivery truck ~0.3 kiloton***
  - ***Fueled 757/767 at speed ~0.8 kiloton total***
  - ***Typical LNG marine tanker ~0.7 megaton***
- ***Inflexibility of fuels and equipment***

Energy efficiency success stories

Southwire Corporation:

halved energy per pound
— saved 4,000 jobs at ten plants.

Energy efficiency success stories

Dow's Louisiana Division:
implemented over 900 worker-suggested savings projects — achieved annual savings of over $110,000,000.

ROI averaged over 200%;
ROI and savings kept rising.

A typical community spends more than 20 percent of its gross income on energy—and 80 percent of those dollars

immediately leave the local area

Energy efficiency in Osage

Instead of a power plant, the utility implemented efficiency programs that:

- ✓save $1 million/year - average home owners save almost $200 a year in energy bills; many local businesses save much more
- ✓Reduced electric bills to 1/2 the state average

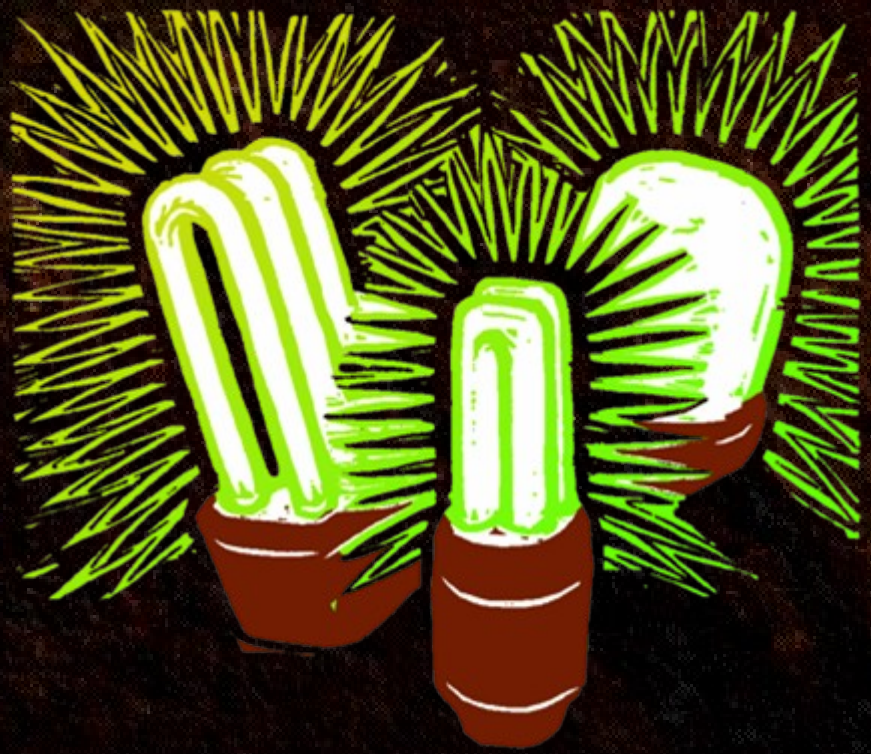
Gives Osage unemployment that is half the national average because new companies came to town

Combine energy efficiency and renewable energy

- Sacramento California - shut down 1,000 MW power plant, invested instead in efficiency, wind, solar, co-generation
  - ✓ Increased regional income by $130 million.
  - ✓ Had the plant kept running rates would have increased 80%. Kept rates same for decade,
  - ✓ This retained over 2,000 jobs and created 880 new jobs
  - ✓ The program eliminated the utility's debt

State-of-the-shelf

Technologies can make old buildings 3X to 4X more efficient — new buildings 10X.



5×-more-efficient midsize SUV

An concept car developed by Hypercar, Inc., www.hypercar.com

- 99 mpg-equiv. (345-bar H_2)

- <1/2 the weight of LX-300
- Hauls 1/2 ton up a 44% hill
- 5 adults, up to 69 ft^3 cargo
- Safer and more crashworthy
- All-wheel digital traction
- 0–60 mph in 8.2 seconds
- 55 mph on < a/c energy use
- Zero-emission (hot water)
- Competitive cost expected
- Decisive mfg. advantages

Super efficient cars

...may spell the end of smokestack industries as we know them, and the beginning of successor industries. $10b committed to development. Such cars should be widely available in 5 years, dominant in 10

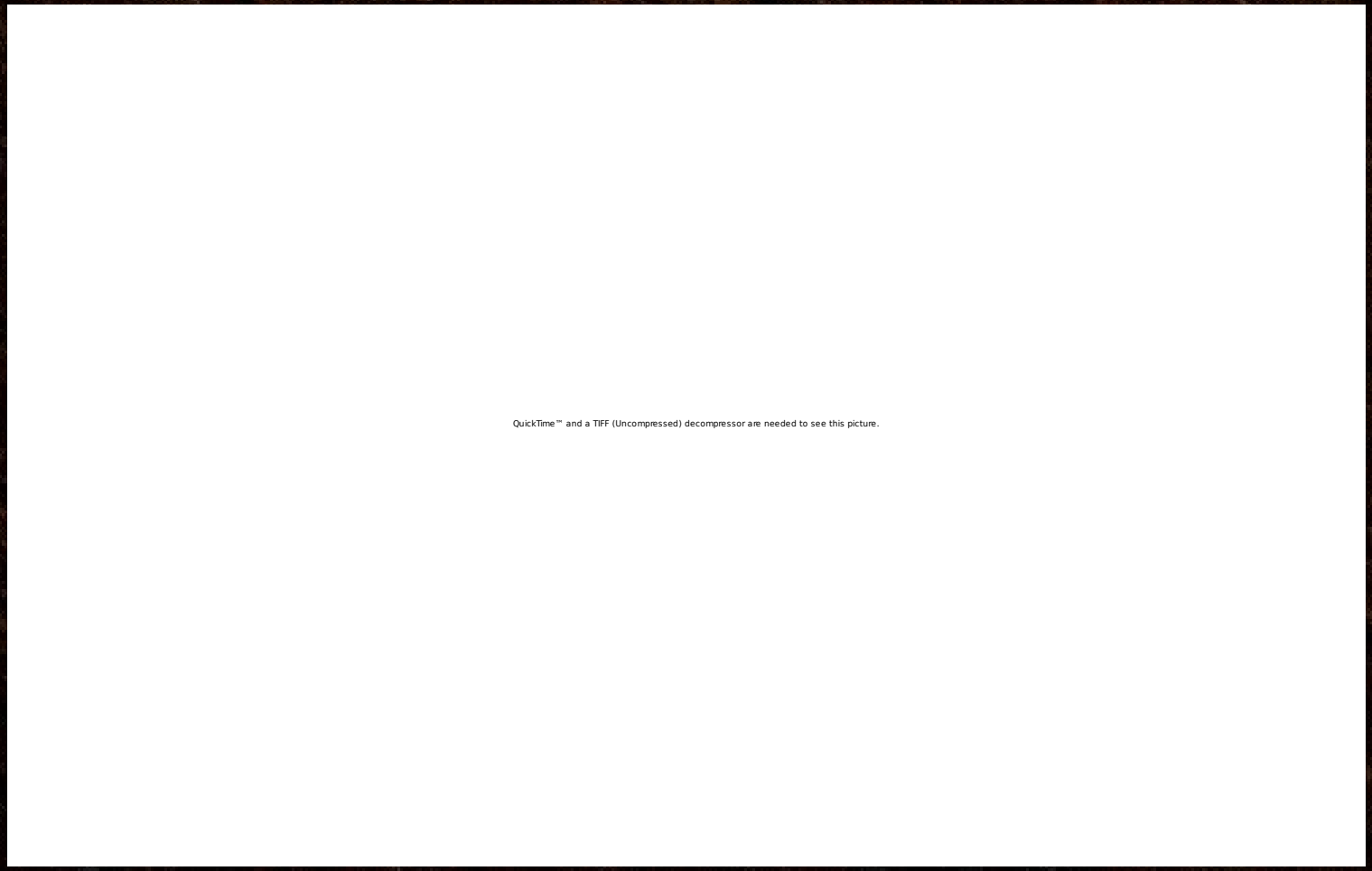
Four Times Square, NYC

(Condé-Nast Building)

- *150.000 m²; 47 storeys*
- *non-toxic, low-energy materials*
- *50% energy savings/m² despite doubled ventilation rates*

- *Fuel cells*
- *Integral PV in spandrels on S & W elevations*
- *Ultrareliable power helped recruit premium tenants at premium rents*

Super efficient military vehicles



Super efficient military vehicles

M1A2 tanks 1500 HP can make their 68 ton
dash at 30 MPH

- 60 - 80 % of the time the turbine idles at 1
  efficiency to run a 5kW “hotel load”
- Civilian vehicles use a small power unit fo
- Tanks don’t: fuel is assumed to cost $1/ga
- Such inefficient vehicles need helicopter
  Supported deliveries, raising the cost t
  $400/gal
- More efficient tanks would enhance warfig
- What about all base vehicles…?

Super efficient military vehicles

An armored division may use 20 - 40 x as many tons of fuel as it does ammunition 600,000 gallons of fuel a day

Of a unit’s 10 least efficient vehicles, only ar Abrams and an Apache are combat veh - several of the rest carry fuel.

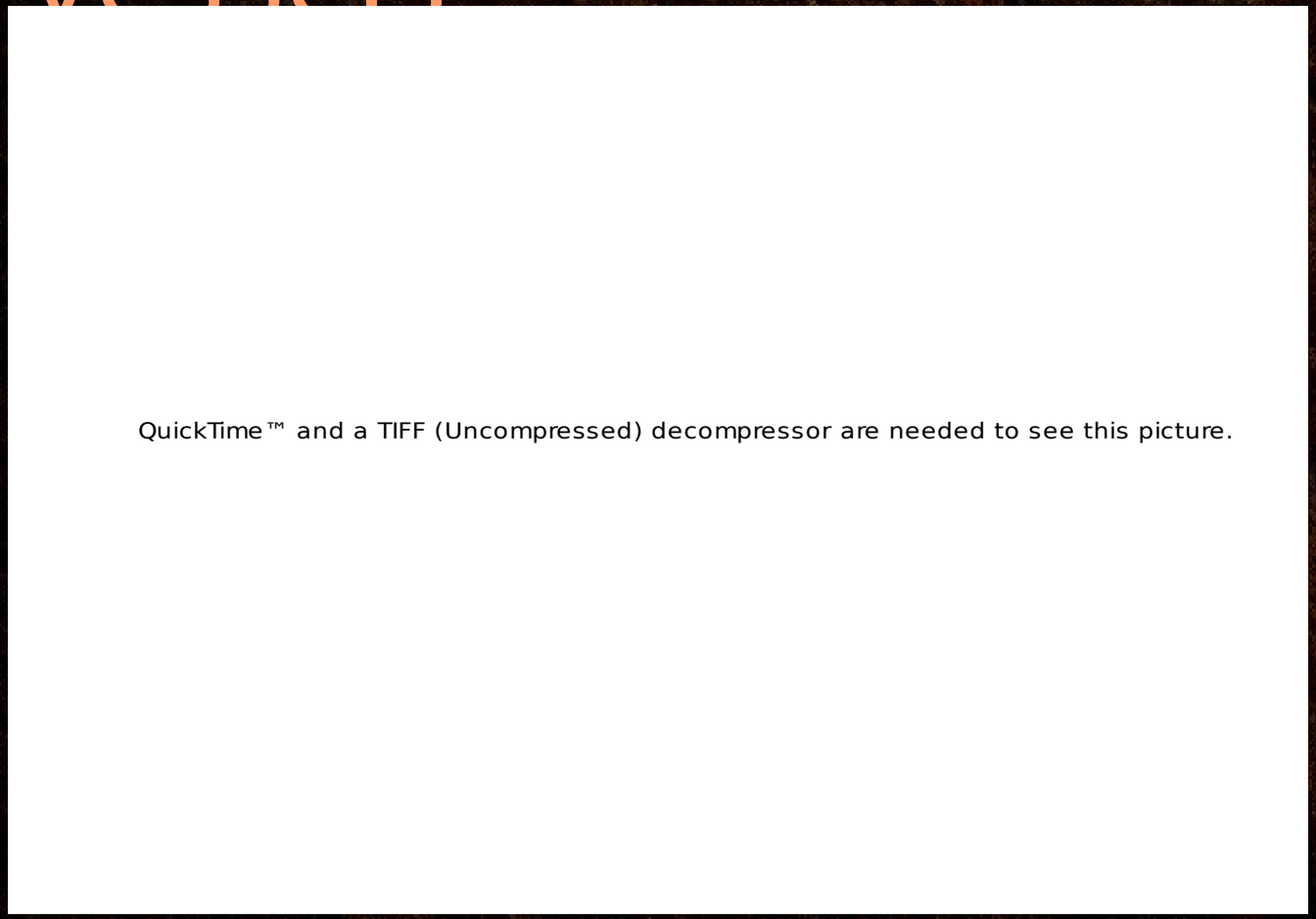
Super efficient military vehicles

Comprehensive military fuel efficiency could
save upwards of tens of billions of dollar
each year

The few billions of dollars in direct fuel savin
would avoid far bigger fuel delivery cost
saving perhaps a division's worth of fue
delivery personnel, and equipment and
support pyramids

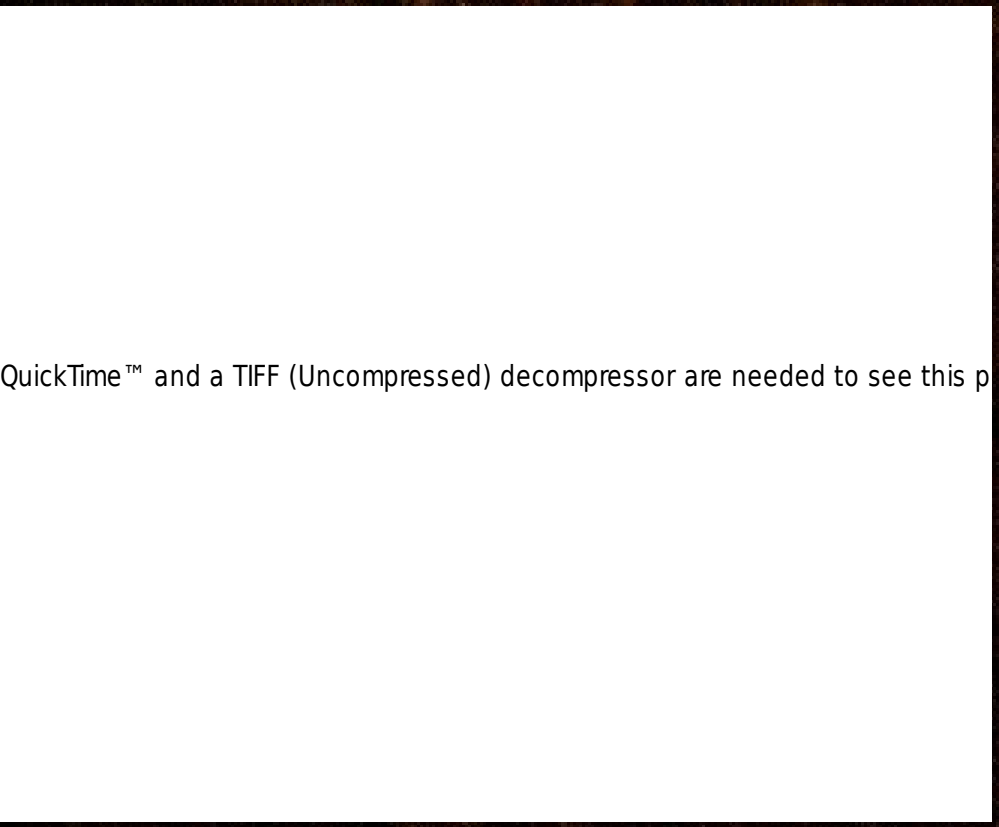
Briefing to Defense Science Board 1999

Super efficient military vessels



A 17 Ft/ gal aircraft carrier is just as unnecessarily inefficient as civilian vehicles

Super efficient military vehicles



In 1999 the Air Force spent $1.8 billion for 2 billion gallons of fuel.

Delivering that into airplanes (6% of the gallons used) cost $4.4 billion more (or an average of $17.50/gal

Re-engining B-52's wou be very cost effective

DuPont's Goals

- Cut greenhouse gas emissions 65% 1990–2010
- Raise revenues 6%/y 2000–2010 with no increase in energy use
- By 2010, 10% of energy & 25% of feedstocks from renewables

ST Micro-electronics' Goals

Zero net CO_2 emissions by 2010

40-fold increase in production over 1990

Went from #12 chipmaker in the world to #6

BP, Amoco, ARCO, Castrol.
What does it add up to?

It means the world's leading producer of solar power

Tomorrow, we begin building a new brand of progress for the world.

beyond petroleum

Removing the contradiction between work life and home life

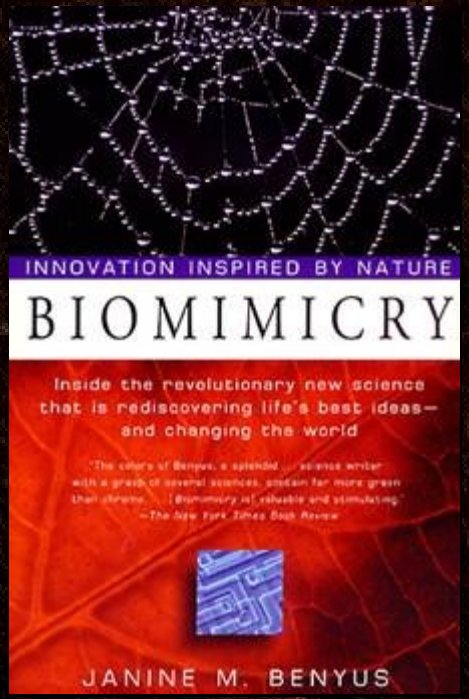
...makes natural-capitalist firms the most exciting places to work.

Protecting the climate is profitable

Sustainability pays

- It is no accident that the companies in the Dow Jones sustainability Index outperform the general market
- Or that the Domini Index outperforms the Standards and Poors Index
- Or that regions that protect their environment outperform those that do not

Biomimicry


INNOVATION INSPIRED BY NATURE
BIOMIMICRY
Inside the revolutionary new science that is rediscovering life's best ideas—and changing the world
JANINE M. BENYUS

How Does Nature do business?

- Low energy flows
- Near Body manufacturing
- No persistent toxics
- Ambient temperature manufacturing
- Closed loops, in which the output of any process is food for another process

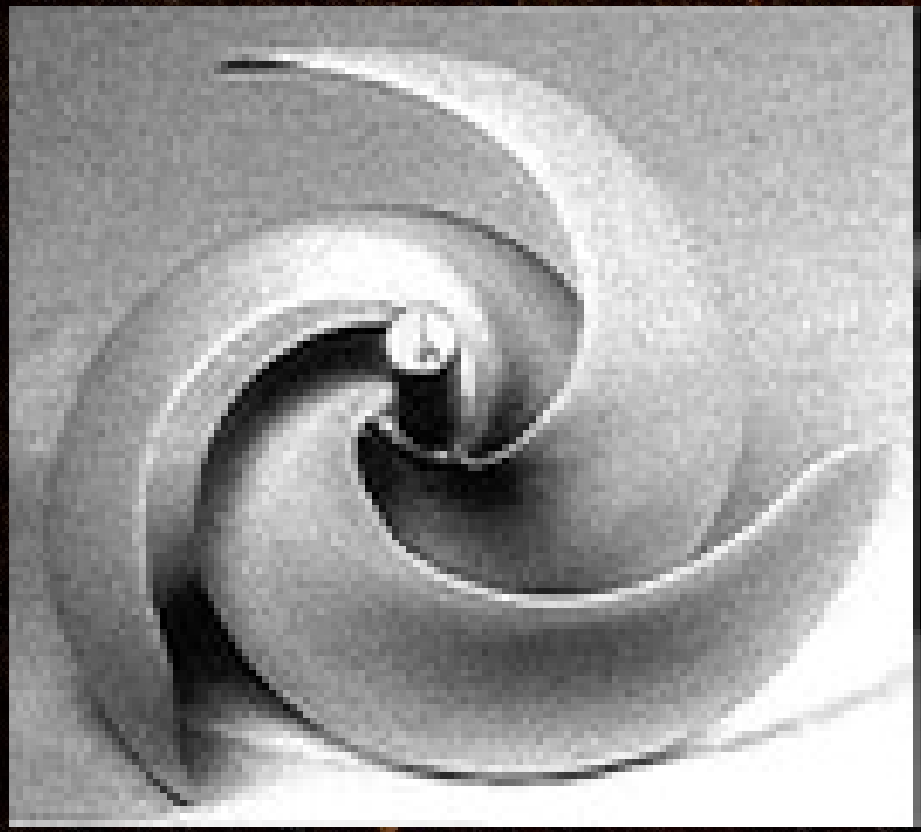
Nature as mentor

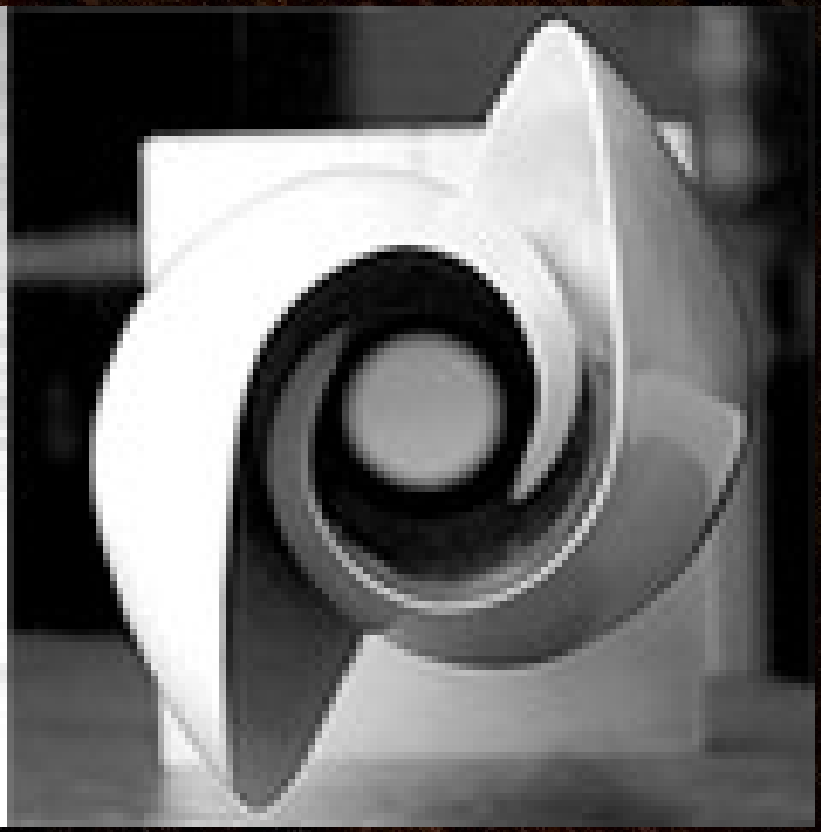
Spiders make silk, stronger than steel and
tougher than Kevlar, from digested crickets
and flies, at room temperature without boiling

Nature as mentor

The Abalone excretes proteins that assemble an electrically charged framework on which seawater deposits minerals, forming a crystalline inner shell twice as tough as ceramics - all accomplished in ambient temperature water, with zero waste.

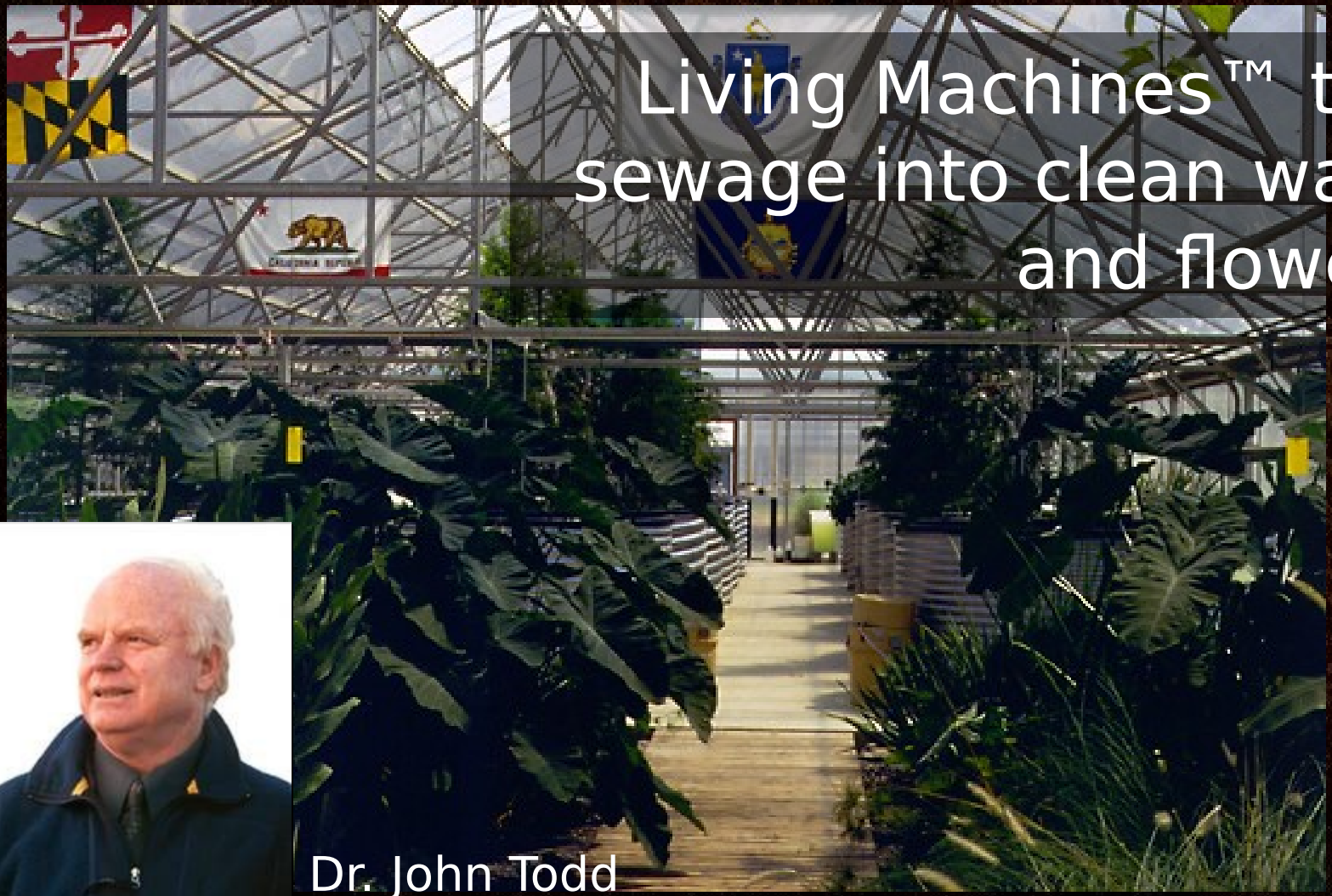
Streamlined efficiency





PAX Impeller--modeled on the streamlined shape of seashells, moves twice the air with 20% less electricity & 75% less noise

How would you design a sewage plant if you had to live downwind?



Living Machines™ turn sewage into clean water and flowers.

Dr. John Todd

Biomimicry principles

Does it

- run on sunlight?
- use minimal energy?
- fit form to function?
- recycle everything?
- curb excess from within?
- reward cooperation?
- Eliminate toxicity?
- Is it beautiful?

Nature creates conditions conducive to life

The Ultimate Evidence:

Synthetic Compounds Found In Mother's Milk

HALOGENATED COMPOUNDS
chlorodifluoromethane
chlorotrifluoromethane
dichlorofluoromethane
chloromethane
trichlorofluoromethane
dichloroethylene
Freon 113
methylene chloride
chloroform
1,1,1 – trichloroethane
carbon tetrachloride
trichloroethylene
chloropentane
chlorobenzene
iodopentane
3-methyl-1-iodobutance
chloroethylbenzene
dibromodichloromethane
dichlorobenzene

ALDEHYDES
acetaldehyde
methyl propanal
n-butantal
methylbutanal
crotoaldehyde
n-penanal
n-hexanal
furaldehyde
n-heptanal
benzaldehyde
n-octanal
phyenyl acetaldehyde
n-nonanal
methyl furaldehyde
n-decanal
n-undecanal
n-dodecanal

KETONES
acetone
methyl ethyl ketone
methyl propyl ketone
methyl vinyl ketone
ethyl vinyl ketone
2-pentanone
methyl pentanone
methyl hydrofuranone
2-methyl-3-hexanone
4-heptaonone
3-heptaonone
2-heptaonone
methyl heptaonone
furyl methyl ketone
octanone
acetaphenone
2-nonanone
2-decananone
alkylated lactone
phthalide

OXYGENATED ISOMERS
C_4H_6O
$C4H_8O$
$C_5H_{10}O$
$C_4H_6O_2$
$C_7H_{10}O$
$C_7H_{14}O_2$
$C_6H_6O_2$
$C_6H_{16}O$
$C_7H_8O_2$
$C_9H_{18}O$
$C_8H_6O_2$
$C_{10}H_{12}O_2$
$C_{10}H_{14}O$
$C_{10}H_{16}O$
$C_{10}H_{18}O$
$CH_{10}H_{20}O$
$C_{10}H_{22}O$
C_9H_8O

ALCOHOLS
methanol
isoproponal
n-proponal
1-butanol
1-pentanol
x-furfuryl alcohol
2-ethyl-1-hexanol phenol
2,2,4-trimethylpenta-1,3-diol
x-terpineol

ACIDS
acetic acid
decanonic acid

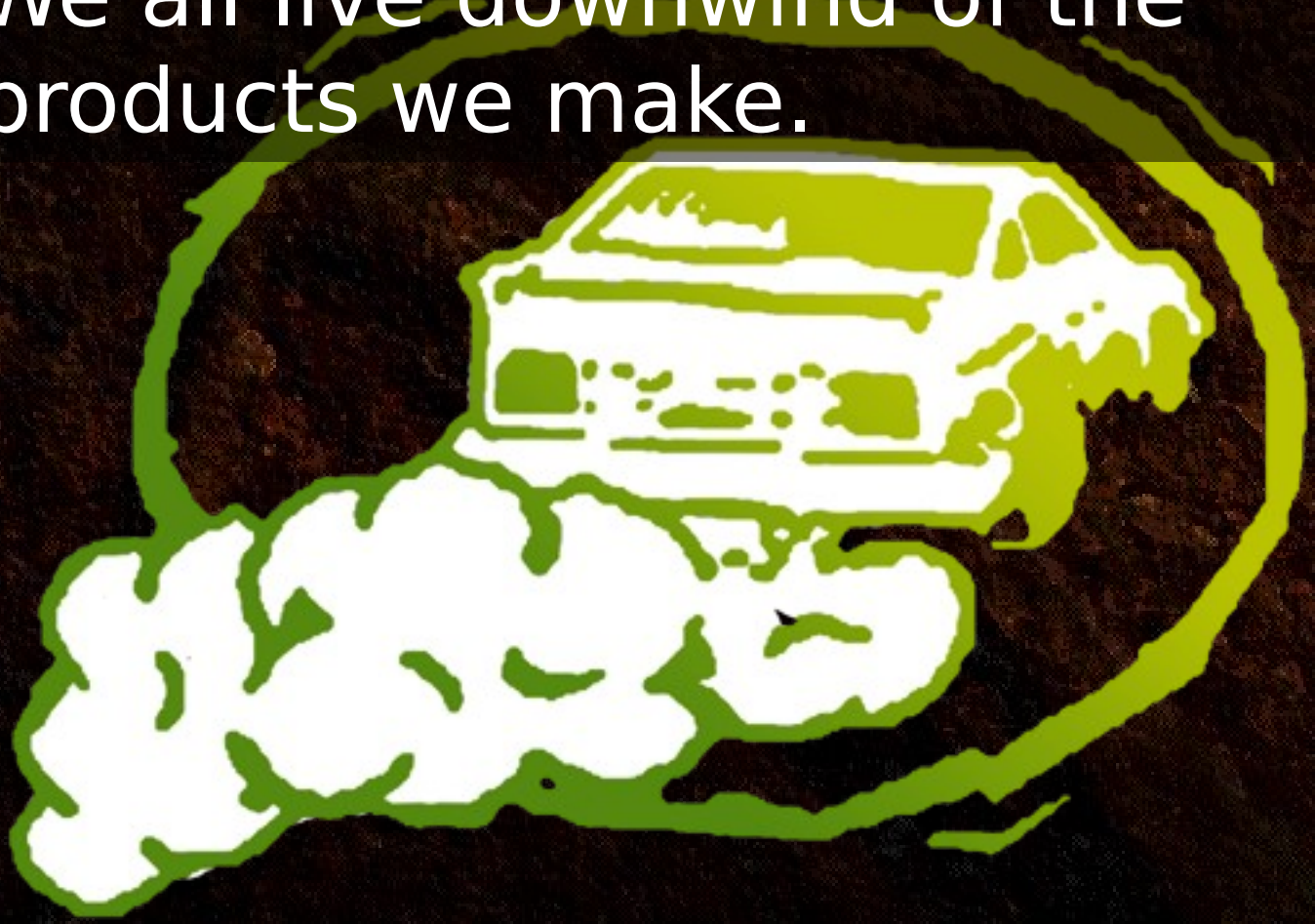
Nature as mentor

Design that adopts the experience of life, refined by 3.8 billion years of rigorous testing.

All products that didn’t work were recalled by the Manufacturer.

The Golden Rule...

We all live downwind of the products we make.



Restoration

Whole-system approaches

Flooding rice fields after harvest turns the enterprise into a source of millions of wildfowl, high-silica straw, groundwater recharge, and other benefits.

…now 30% of California's rice acreage

A Tri-partite World

Governments have enormous power - but at Johannesburg, the governments of the world were unable to commit to an action plan for Agenda 21

A Tri-partite World

- Of the world's 100 largest economic entities today, well over half are not nation-states but corporations
- The business community may be the only institution that has the resources, skills, and motivation to solve these tough problems.

A Tri-partite World

In an Internet empowered world, small groups of citizens can delegitimize any company or or cc

New theory of governance

- How can we meet the challenges of sustainability
- Need a new system that gives a seat at the table to all of the key sectors
- Joburg tried: first Summit with a major presence of business

The European Union is also emphasizing energy efficiency and renewables

The Energy Intelligent Europe Initiative, signed by Parliamentarians from all 15 members, calls for integrating energy efficiency and renewable energy as the basis for European competitiveness and high quality of life.

The EU seeks to get 22% of its electricity and 10% of its energy from such clean sources as wind within 10 years

The European Union has already adopted a “Factor Four” policy.

Holland and Austria have declared “Factor Four” a national goal.

The World Business Council for Sustainable Development and the United Nations Environment Programme have called for Factor Ten to

Challenges Military Bases Face

- Enabling the mission of the Armed Forces

www.envquest.com
Kevin Palmer's site
Describes the work o
FORSCOM

Six bases that are enhancing their sustainability

Challenges Military Bases Face

- Demonstrating leadership in a world in
  - trouble

Be recognized as a world
Leader in practicing globa
citizenship and protectin
sustainability values

Sustainable Ft Bragg
vision statement

Challenges Military Bases Face

- Being a good neighbor

Ft Bragg began this effort in pa because the three star felt it would help the base with its “community challenges”

Challenges Military Bases Face

- Being able to do your work

In an Internet empowered world you will lose any stakeholder conflicts, unless you maintain goodwill

Some numbers:

- DOD budget: over $300 billion and rising
- 3 million people
- 36 million acres
- Over 350 major installations
- 40,000 additional properties
- 550 public utility systems
- Over 150,000 land vehicles
- 22,000 aircraft
- Over 300 ocean going vessels

- Are these resources efficiently

What can you do

- Ensure you are managing for sustainability:

  buildings, vehicles

- Ensure adequate information
- Purchase local, purchase sustainable
- Experiment: fund approaches the private

  sector will not

- Transparency - set clear indicators
- Stakeholder involvement

Ft Carson: encroachment: 25 yr goals

- Sustain all facility and mobility with renewable resources and reduce water use
- Enhance partnering to collaboratively develop integrate and implement regional sustainability
- Reduce total weight of hazardous air pollution emissions to zero
- Build all applicable facilities to high performance (green) standards
- Ensure that all procurement actions support sustainability; >20% over 5 yrs; offer incentives
- Reduce the total weight of solid and hazardous waste disposed of to zero

What kind of world do you want?

A world of conflict

Or a world in which there is no net loss

Of natural
or
human capital

As Edgar Woolard remarked when chairman of DuPont:

"Companies that take such opportunities seriously will do very well...

...while those that don't won't be a problem — because ultimately they won't be around."

A competitive advantage:

1. Radically increased resource productivity
2. Biomimicry: closed loops, no waste, no toxicity
3. Reinvest in natural capital

Ensure no net loss of human or natural capital

It’s up to you

www.natcapgroup.org
— and —
www.theglobalacademy.org